Effect of Attitudes to Programed Instruction and Other Media on Achievement from Programed Materials[1]

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The attitudes of teachers toward instructional devices employed by their pupils would appear to be of considerable importance to educational researchers. In informal conversations with personnel involved in the implementation of automated devices in the classroom, the teachers' fear of and resistance to these new devices is frequently noted. It is surprising, therefore, that there is little systematic research regarding such fears among teachers. What little research there is strongly confirms the presence of a fear of automation among teachers.

In previous research (Tobias, 1963) teachers' attitudes towards three groups of terms describing instructional devices were studied. The terms were substantially similar and differed mainly in the degree to which each term connoted automation. One set of terms described traditional teaching aids

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such as flash cards, workbooks, and exercise books. The other two sets described materials connected with programed instruction; one group of terms described these materials with labels stressing mechanization and automation, and the other set of terms omitted these implications. The results indicated that the least favorable attitudes were held concerning terms connoting automation, followed by the programing terms, with traditional terms receiving the most favorable responses. Significant differences among essentially synonymous terms, such as *programed instruction* and *automated instruction,* were found and attributed to the differences in the degree to which the terms connoted automation.

A further study (Tobias, 1966) provides more direct evidence of the fear of automation among teachers. Three sets of terms drawn from audiovisual education and programed instruction, stressing either automation or programing, included one term with the word *tutor* as a prefix or suffix, i.e., *TV-tutor, mechanized tutor, tutor-text.* Since these terms most directly suggested replacement of the teachers' function it was expected that teachers would have the most negative reaction to them. This prediction was clearly confirmed.

In a further study (Tobias, 1968a) teachers' ratings of 16 terms describing instructional devices were factor-analyzed. Three varimax-rotated factors emerged from this analysis. The obtained factor structure was interpretable entirely in terms of whether a particular device was used under the control of the teacher or in the absence of the teacher. Two of the factors had high loadings on devices used in the absence of the teacher (e.g., automated instruction, TV tutor), and one factor had high loadings on instructional devices used in the classroom by the teacher (e.g., workbook, exercise book). As expected, this latter factor received significantly more favorable ratings than did either of the others.

The purpose of the present paper was to investigate two questions raised by the previous research. First, do the attitudes isolated in previous investigations correlate with intellectual abilities or emotional traits? Second, what was the effect of these general attitudes towards instructional devices on student achievement from programed materials?

SUBJECTS AND PROCEDURES Data for a total of 201 subjects (Ss) were collected for this study. These Ss had volunteered for two other investigations

studying the effect of a number of variables on achievement from programed instruction (Tobias 1968b, 1969). Subjects were recruited from undergraduate educational psychology classes, and consisted mainly of students enrolled in teacher-education programs. The total sample consisted of 134 females and 67 males. The mean age for the total sample was 20.4.

Subjects were asked to rate their attitudes toward 20 terms describing instructional media on six scales drawn from the semantic differential (Osgood, Suci, & Tannenbaum, 1957). The terms are reproduced on Table 1, and appeared at the top of the page succeeded by the following semantic dif-ferential scales: good-bad, worthless-valuable, fair-unfair, meaningless-meaningful, wise-foolish, and disreputable-rep-utable. Positive and negative poles were varied as above to avoid positional bias.

The terms describing instructional media were ordered into a random sequence by means of a table of random numbers. Questionnaires were collated beginning with a different term in the sequence for each booklet. This procedure varied the order of appearance of each term within the sequence. The attitude forms were filled out by Ss one session prior to their exposure to any instructional materials.

RESULTS AND DISCUSSION

The semantic differential scales were assigned scores from seven, for the positive pole of each scale, to one for the nega-tive. The scores for each of the 20 terms were intercorrelated and subjected to a principal components factor analysis and varimax rotation. Table 1 gives the varimax loadings for all 20 terms on four factors.

Principal components analysis[2] yielded five factors with eigen-values above unity. In view of the fact that the five-fac-tor solution was substantially similar to the four-factor solu-tion, with the exception of the fact that factor V emerged with high loadings only on *textbook* and *study guide*, the separa-tion of which was irrelevant to the essential purposes of this investigation, the more economical four-factor solution was utilized for further analysis.

Factor I clearly emerges as an automation-programing fac-tor. Since terms like *TV-tutor* and *educational television* have

[2] Copies of the correlation matrix, principal components factor analysis, and five factor rotation have been deposited with the American Science In-formation Service. Order Document NAPS-0056 from ASIS National Aux-iliary Publications Service, 22 West 34th St., New York, N. Y. 10001.

TABLE 1		Factors				
Factor Loadings for All Terms[a]	Terms	I	II	III	IV	Communality
	Teaching Machine	81				.70
	Programed Instruction	76				.63
	Automated Instruction	74		26		.67
	Mechanized Tutor	67		40		.62
	Computer-Assisted Instruction	66			32	.58
	Programed Text	64	40			.60
	Programed Self-Study	64		32		.51
	TV Tutor	62			49	.64
	Exercise Book		80			.66
	Workbook		80			.66
	Filmstrip		62		30	.50
	Study Guide		61			.39
	Textbook		54			.32
	Educational Film		50	58	26	.68
	Educational Technology	36	49			.42
	Self-Instructional Program			75		.64
	Flash Card		33	62		.50
	Tutor Text	27	31	40		.33
	Audiovisual Education		38		76	.71
	Educational TV	39			68	.63
	Percent Total Variance	22	17	9	9	
	Percent Common Variance	38	30	16	16	

[a] Decimal points, and loadings ≦ .25 omitted to clarify table.

substantial loadings on this factor, more than programing appears to be tapped. Factor II has its highest loadings on traditional devices used in the classroom. The high loadings on *exercise book, workbook, filmstrip,* and *study guide* clearly indicate that this factor represents devices used by the teacher in the class. Factor III also represents traditional devices, but devices not used under the control of the teacher. The high loadings on *self-instructional program* and *flash card,* together with moderate loadings on *educational film, tutor text,* and *mechanized tutor,* indicate that the devices having highest loadings on this factor are used independently of the teacher. Factor IV emerges clearly as an audiovisual devices factor with its major loadings on *audiovisual education,* and *educational television.*

The present factor structure is substantially similar to that obtained in a prior investigation (Tobias, 1968a). In both studies the factor structure cut across content categories— that is, terms taken from programing and audiovisual education ended up, in some instances, with high loadings on the same factor. In both studies clearcut programing-automation, traditional, and audiovisual education factors emerged. The present structure differs primarily in that traditional devices are split into two factors, one reflecting mainly devices used *in* the classroom, and the other materials used *outside* of it. What differences there are in the factor pattern are probably attributable to differences between this investigation and the prior one: Four of the terms in this study were not used previously (*computer-assisted instruction, programed self-study, study guide,* and *educational film*). The present sample consisted largely of undergraduate students in a teacher education program; the prior sample was composed largely of graduate students who were teachers.

Factor scores were then computed for all Ss and intercorrelated with other available measures. These data are presented in Table 2. Since the same data were not available for all Ss the number of cases on which each of the correlations was based is given in the first column of Table 2, adjacent to the columns for the attitude factors. These data indicate a significant relationship of small magnitude between intellectual ability, represented by the SAT-Verbal and Quantitative scores and factors II and III. Apparently having positive attitudes toward traditional devices was negatively related to scholastic ability. On the other hand, favorable attitudes towards traditional devices used outside of the classroom were positively

TABLE 2
Correlations
between Factor
Scores and
Selected
Variables[c]

Variable	N	F I	F II	F III	F IV
SAT-V	182	14	-24^{b}	20^{b}	-05
SAT-Q	182	12	-17^{a}	15^{a}	-03
AAT+	201	02	-07	-05	03
AAT−	201	-03	08	-06	01
I/E	201	00	-04	03	07
PI Group	72	26^{a}	-42^{b}	04	-10
Reading	79	15	-13	01	05

[a] $p \leq .05$; [b] $p \leq .01$; [c] decimals omitted.

related to scholastic ability. It should be kept in mind that while unlikely to have occurred by chance, these relationships are small, and thus should not be overinterpreted.

Table 2 also indicates that none of the measures representing affective characteristics was related to the attitude factors. The AAT+ (Alpert & Haber, 1960) scores can be conceptualized as anxiety which facilitates performance, and the AAT- as anxiety which is debilitating to performance, in academic achievement situations. The I/E scale (Rotter, Seeman, & Liverant, 1962) is related to the construct of the degree to which an individual sees himself as being in control of circumstances, as opposed to experiencing himself as being ruled by environmental circumstances. The data, thus, suggest that there is a small relationship between attitudes to traditional instructional devices and intellectual abilities, but that the emotional traits measured in this study were orthogonal to attitudes concerning media.

Of the total subject pool 72 Ss participated in a study in which they worked a linear program requiring constructed responses and dealing both with widely known and with technical subject matter in the area of heart disease (Tobias, 1969). This is the PI group in Table 2. The same program cast in the form of completed sentences, without requiring any overt responses or offering specific feedback, was taken by 79 Ss referred to as the Reading Group in Table 2. Achievement differences between the groups are reported elsewhere (Tobias 1968(b), 1969). Correlations between Ss' achievement on the instructional material and their factor scores on the attitude data are shown in the last two rows of Table 2.

For the PI group the correlations between achievement and both factors I (programing-automation) and II (traditional devices) were significant. The multiple correlation between factors I and II combined and achievement from the program was .48. None of the correlations between the factors and achievement for the reading group was significant. These results indicate that Ss' attitudes concerning programed and automated devices, and especially their attitudes towards traditional devices, were highly related to their actual achievement from an instruction program. The magnitude of the relationship between these attitudes and achievement for the PI group is surprisingly high. Even with sholastic aptitude—repre-

sented by the SAT verbal and quantitative scores—held constant, the attitudes represented by factors I and II still account for 16 per cent of the achievement variance, a finding significant beyond the .01 level.

These findings suggest that the Ss' underlying attitudes towards instructional media account for a substantial percentage of achievement variance. Apparently, Ss with highly positive attitudes towards the tried and true devices, such as exercise books and workbooks, tend not to learn as much from new media such as programed instruction. It would, of course, be important to replicate this finding prior to making hasty generalizations regarding its significance. However, one aspect of these results fits in with previous findings. In prior research (Tobias 1963, 1966) it has been suggested that teachers' negative attitudes towards programed instruction might interfere with a pupil's achievement from such materials. The present study provides some evidence suggesting that preferences for one kind of instructional material—that is, traditional devices—is negatively related to achievement from programed instruction. The fact that most of the Ss in this study were presently students, but future teachers, has disturbing implications for attitude transmission from teacher to pupil. The results suggest that the negative attitudes held by the Ss of this study interfere in their own achievement from programed materials, and one would assume that these attitudes when transmitted to pupils are likely to negatively affect their achievement from such materials as well.

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